

adult characters. It is known that grasshoppers will not infrequently miss out a larval stage to produce small sized adults (Wigglesworth, personal communication) but *P. pictus* appear to omit one or more than one nymphal stages and undergo precocious metamorphosis during summer to produce diminutive adults. In fact the case of precocious metamorphosis in *P. pictus* reported in the present communication is very interesting as they were not produced by allectomy in the laboratory but appear in nature on their own under the climatic conditions of hot summer months. The appearance of similar diminutive adults in

laboratory reared stock is clearly a recurrence of the same phenomenon namely of precocious metamorphosis first observed in the field population. A thorough investigation of climatic and nutritional conditions in the field supported by experimental studies in the laboratory are needed to explain under what set or sets of climatic and nutritional conditions, precocious metamorphosis occurs in the population of *P. pictus* in nature.

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23. MIXED INFECTION OF LAC

The one problem for any living creature is that of food and in the case of parasites of plants, like the scale-insects, it means host-selection. But until we can rear the insects apart from the tree we shall never be able to know exactly what they feed upon. In view of the many technical difficulties enabling us

to grow lac insects, so to say, in vitro, it was imagined that the symbiotic, yeast-like germ, that lives within the lac insect, would indirectly enable us to know what the insect really gets from the plant. In an article on lac cultivation (1919) I had suggested, supported by several preceding authorities, that probably

gum constitutes the main source of food. I had, with my friend, Mr. Sreenivasaya (1928) grown the symbiotic germ on different culture media with the result that, as source of carbohydrate, gum-arabic gave the best result, and as that of nitrogen, uric acid. Uric acid is an excretory substance so that when the germ utilizes it there is a great economy in insect metabolism. Thus indirect evidence fully confirmed that lac insects feed on plant gums.

Now other scale-insects were also seen on the favourite host plants of lac insects. For instance, the lac insect, *Kerria communis*, was frequently found on the Champac tree, *Miche- lia champaca*, which also proved to be a host of the wax insect, *Ceroplastes cerriferus*. But it is possible that physiological conditions in two different plants of the same species may radically differ. Nothing would be better than to find a lac-insect and a wax insect growing close together so that, in this case, the foodstuff must necessarily be the same. There were two species of wax insects, in Bangalore, where the above observations were carried out. The other grew best on *Dodonaea viscosa* (1936). A new species named *Ceroplastes vayssierii* Madh., it was never found on *M. champaca*.

The species *K. communis* is found in Kerala, Tamilnadu, Andhra Pradesh, Karnataka, Goa, and Maharashtra, but nowhere is it exploited for cultivation. It tends to produce such a

preponderance of males that it does not pay to cultivate it. On the contrary, in Karnataka, the species *K. mysorensis* is the lac insect cultivated on *Shorea talura*. Since this tree permits cultivation it was studied by preference. Yet few scale insects were found on it. The most common was a species of *Lecanium* which was propagated by the ant *Oecophyla smarag- dina*, which is well known. But besides the symbiotic occurrence of that *Lecanium* species and, the ant the same scale insect was not conspicuous otherwise. However a species of *Monophlebius* was found occupying forked branches of *S. talura*. This insect I believe is not identical with *M. stebbingii* and probably is a new species.

Occasionally a species of *Cyrticera* scale insect was found on the leaves of *S. talura*. I am grateful to the Commonwealth Bureau of Entomology for the probable identification of the coccid. In Sind the lac species *K. sin- dica* is cultivated on *Acacia arabica*. It has been found besides on *Albizzia lebbek*, *Zizy- phus jujuba* and *Anona squamosa*. The same species of *Crypticera* was seen profusely growing all round a vertical stem of *A. squamosa* while a neighbouring stem supported *K. sin- dica*. Previous observations have shown that the predacious caterpillars of *Eublemma scitula* attacked other Coccids as also lac insects. No other parasite, chalcid or otherwise, have been found sharing as hosts, lac and other scale insects.

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